



## Taxonomic Notes of the Family Pseudococcidae (Sternorrhyncha) in Korea

### I. Tribes Phenacoccini, Rhizoecini, and Sphaerococcini

Gi-Myon Kwon\*, Evelyn Danzig<sup>1)</sup>, and Kyu-Tek Park<sup>2)</sup>

Division of Entomology, National Institute of Agricultural Science and Technology, Suwon, 441-707, Korea. E-mail: scalekgm@hanmail.net

<sup>1)</sup>Zoological Institute, Russian Academy of Science, Petersburg, 199034, Russia

<sup>2)</sup>Center for Insect Systematics, Kangwon National University, Chuncheon, 200-701, Korea

**Abstract** A total of 22 species belonging to nine genera of the tribes Phenacoccini, Rhizoecini, and Sphaerococcini (Sternorrhyncha: Pseudococcidae) are noted in Korea, with descriptions and illustrations for full grown female. Among them, three species, *Heliococcus puerariae* sp. nov., *Heliococcus zoysiae* sp. nov., and *Phenacoccus rubicola* sp. nov., are new to science, and four species, *Coccurea comari* (Künow, 1880), *Heliococcus kuriensis* Danzig, 1971, *Puto erigeroneus* (Kanda, 1959), and *Puto orientalis* Danzig, 1978, are reported for the first time from the Korean Peninsula, and a species is newly known from South Korea. Eleven species, which previously recorded in Korea, have not been found from South Korea during this study.

**Key words** Systematics, *puerariae* sp. nov., *zoysiae* sp. nov., *rubicola* sp. nov., Korea

## INTRODUCTION

The family Pseudococcidae is the second largest family among Coccinea with 1,947 species belonging to 288 genera (Ben-Dov, 1994). The family can be easily distinguished from their allies by the presence of cerarii, ostioles and circuli. Genera and species belonging to this family are separated by positions and types of pores and ducts.

Most of the mealybugs are serious pests on various agricultural crops. The injury on plants is directly caused by depleting sap or injecting toxins. In recent years, more evidences have been presented in the role of mealybugs as vectors of plant viruses. In addition, the honeydew excretion of mealybug and the sooty moulds, which grow on it, contaminate the plants and fruits, and severely reduce normal photosynthesis (Williams, 1985; Williams and Granara de Willink, 1992).

In Korea, 36 species of Pseudococcidae have been reported by various authors (Table 1). The first record was *Pseudococcus comstocki* (Kuwana) by Machida and Aoyama (1928). After then, Machida and Aoyama (1930), Nakayama (1933) and Saito (1941) added four species. Kanda (1941) reported five additional species, including a new species, *Pseudococcus coreanus* (= *Crisicoccus coreanus*). Borchsenius (1956), a Russian entomologist, reported four

\* To whom correspondence should be addressed.

**Table 1.** Historical reviews of the previous records of the family Pseudococcidae in Korea

Authors (year)	Localities	Species added in Korea
Machida & Aoyama (1928)	S. Korea	<i>Pseudococcus comstocki</i> (Kuwana)
Machida & Aoyama (1930)	S. Korea	<i>Phenacoccus aceris</i> (Signoret)
Nakayama (1933)	S. Korea	<i>Nipaecoccus nipae</i> (Maskell)
	S. Korea	<i>Planococcus citri</i> (Risso)
Kanda (1941)	S. Korea	<i>Brevinnia pulveraria</i> (Newstead)
	S. Korea	<i>Phenacoccus azaleae</i> Kuwana
	S. Korea	<i>Crisicoccus coreanus</i> (Kanda)
	S. Korea	<i>Dysmicoccus wistariae</i> (Green)
	S. Korea	<i>Antonina crawi</i> Cockerell
Saito (1941)	S. Korea	<i>Crisicoccus pini</i> (Kuwana)
Borchsenius (1956)	N. Korea	<i>Helicococcus glycinicola</i> Borchsenius
	N. Korea	<i>Helicococcus herbaceus</i> Borchsenius
	N. Korea	<i>Geococcus oryzae</i> (Kuwana)
	N. Korea	<i>Antonina vera</i> Borchsenius
Ju (1969)	N. Korea	<i>Pseudococcus longispinus</i> (Targioni Tozzetti)
Paik, W.H. (1972)	S. Korea	<i>Planococcus kraunhiae</i> (Kuwana)
Danzig & Ivanova (1976)	N. Korea	<i>Balanococcus orientalis</i> Danzig et Ivanova
Paik, W.H. & Kwon (1977)	S. Korea	<i>Crisicoccus matsumotoi</i> (Siraiwa)
Paik, W.H. (1978)	S. Korea	<i>Crisicoccus seruratus</i> (Kanda)
Danzig (1980)	N. Korea	<i>Coccurea convexa</i> Borchsenius
	N. Korea	<i>Coccurea suwakensis</i> (Kuwana et Toyoda)
	N. Korea	<i>Euripersia herbacea</i> Danzig
	N. Korea	<i>Peliococcus chersonensis</i> (Kiritchenko)
	N. Korea	<i>Phenacoccus interruptus</i> Green
	N. Korea	<i>Phenacoccus poriferus</i> Borchsenius
	N. Korea	<i>Puto pilosellae</i> (Sulc)
	N. Korea	<i>Atrococcus altaicus</i> Matesova
	N. Korea	<i>Atrococcus paludinus</i> (Green)
	N. Korea	<i>Balanococcus takahashii</i> McKenzie
	N. Korea	<i>Humococcus orientalis</i> (Borchsenius)
	N. Korea	<i>Spilococcus pacificus</i> (Borchsenius)
	N. Korea	<i>Trionymus multisetiger</i> (Borchsenius)
	N. Korea	<i>Trionymus perrisii</i> (Signoret)
Danzig (1988)	N. Korea	<i>Trionymus aberrans</i> Goux
Kwon <i>et al.</i> (2002)	S. Korea	<i>Pseudococcus cryptus</i> Hempel
	S. Korea	<i>Pseudococcus dendrobiorum</i> Williams
Total		36 species in 19 genera

S. Korea: South Korea. N. Korea: North Korea.

species from North Korea, including three new species *Helicococcus glycinicola*, *Helicococcus herbaceus*, and *Antonina vera*. Danzig and Ivanova (1976) reported a new species, *Balanococcus orientalis*, from North Korea. Danzig (1980, 1988) reported 20 additional species from North Korea, including a new species, *Euripersia herbacea*.

As Korean, Ju (1969) listed four species from North Korea. Paik (1972) and Paik and Kwon

(1977) reported two species. Paik (1978) listed 11 species of the family, with redescription, illustration, distribution, host plants, biology, and natural enemies. Recently Paik (2000) reviewed 33 species of Pseudococcidae in the Korean Peninsula, based on previous records, and Kwon *et al.* (2002) reported four species.

A taxonomic notes of the family Pseudococcidae in Korea was carried out, based on about 1,300 specimens collected by authors and other researchers (in the National Institute of Agricultural Science and Technology (NIAST)) during 1996 to 2001 and by Woon-Hah Paik during 1971 to 1978. The external morphological character were described and illustrated for full grown female, using the Olympus BX60 attached with drawing tube (U-DA). Illustrations were shown with the dorsal surface on the left and the ventral surface on the right. All specimens are deposited in the Insect Collection of NIAST. Abbreviations are given as follows; TS: Type species. TL: Type locality. GG: Prov. Gyeonggi-do; GW: Prov. Gangwon-do; CB: Prov. Chungcheongbuk-do; CN: Prov. Chungcheongnam-do; JB: Prov. Jeollabuk-do; JN: Prov. Jeollanam-do; GB: Prov. Gyeongsangbuk-do; GN: Prov. Gyeongsangnam-do; JJ: Prov. Jeju-do.

## SYSTEMATICS

### Family Pseudococcidae Cockerell, 1905 가루깍지벌레과

Pseudococcini Cockerell, 1905, Tables Iden. Rocky Moun. Coccidae: 195.

Pseudococcinae: Borchsenius, 1949, Fauna SSSR 7: 84.

Pseudococcidae: Ferris, 1950, Atlas scale ins. North America 5: 1.

Adult female: Body oval or elongated oval, with head, thorax, and abdomen closely fused. Cuticle membranous. Body color various, usually yellowish, gray, pink, or red. *Dorsum*. Ostioles with 2 pairs of slit-like openings. Cerarii 1–18 pairs. Anal ring on 9th abdominal segment. Setae usually shorter than venter. Pores of different types: simple, trilocular, quinquelocular, multilocular, and discoidal. Ducts of various sizes and types: tubular ducts (oral collar, oral rim, and crateriform). *Venter*. Antennae usually 6–9 segmented, reduced to 2 segments in *Antonina crawi* Cockerell.

Eyes usually domelike. Labium presents between anterior coxae, cone shaped, 3 segmented. Legs normally 5 segmented. Spiracles with 2 pairs on thorax. Circuli 0–4; when present, usually oval or hourglass-like, various in sizes, located on center of abdominal segments. Vulva present between 7th–8th abdominal segments. Setae usually slender and long. Pores and ducts similar to form of these dorsum.

### Tribe Phenacoccini Šulc, 1944 솜깍지벌레붙이족

Phenacoccinae Šulc, 1944, Věstn. Česk. Zool. Společ. Praze 9: 152.

Phenacoccini: Danzig, 1980, Coccids Far-Eastern USSR: 110.

### Genus *Brevennia* Goux, 1940 대나무가루깍지벌레속

*Ripersia* (*Brevennia*) Goux, 1940, Bull. Soc. Hist. Nat. Afrique Nord 31: 58 (TS: *Ripersia* (*Brevennia*) tetrapora Goux, 1940).

*Brevennia*: Borchsenius, 1948, Dokl. Akad. nauk SSSR 61(5): 953.

### *Brevennia pulveraria* (Newstead, 1892) 대나무가루깍지벌레

*Ripersia pulveraria* Newstead, 1892, Ent. Mon. Mag. 28: 145 (TL: Sandiway, Cheshire, England: on *Agrostis tenuis*).

*Dactylopius pulverarius*: Newstead, 1903, Monog. Coccidae British Isles 2: 174.

*Trionymus pulverarius*: Goux, 1933, Bull. Soc. Ent. France 38: 236; Kanda, 1941: 325.  
*Heterococcus pulverarius*: Williams, 1961, Bull. Ent. Res. 51: 673; Williams, 1962: 31.  
*Brevinnia krishtali* Tereznikova, 1962, Dopovidi Akad. Nauk Ukr. RSR 1: 122.  
*Brevinnia pulveraria*: Miller, 1975, Techn. Bull. Agr. Rec. Ser., USDA, Tech. Bull. 1497: 47; Kosztarab & Kozar, 1988: 78; Ben-Dov, 1994: 64; Paik, J.C., 2000: 49.

**Distribution.** Palaearctic (Korea (South), Europe) and Oriental (Pakistan, Sri Lanka) regions.

**Host plants.** World: Gramineae (*Agropyron* sp., *Agrostis stolonifera*, *A. tenuis*, *A. vulgaris*, *Dactylis* spp., *Eragrostis cynosuroides*, *Festuca pratensis*, *Phalaris arundinacea*, *Poa angustifolia*) (Ben-Dov, 1994).

**Remarks.** This species was recorded for the first time from the Korean Peninsula at Dongrae, near Busan, by Kanda (1941) as *Trionymus pulverarius* (Newstead). No more specimen has been collected in Korea.

### **Genus *Coccura* Šulc, 1907 숨털가루깍지벌레속**

*Coccura* Šulc, 1907, Věstn. Klubu. Přírod. Prost. jov : 64 (TS: *Coccus comari* Künow, 1880).  
*Rosanococcus* Kanda, 1934, Insect World 38: 311 (TS: *Phenacoccus suwakowensis* Kuwana et Toyoda, 1915).

#### ***Coccura comari* (Künow, 1880) 반구숨털가루깍지벌레 (신칭) (Fig. 1)**

*Coccus comari* Künow, 1880, Entomol. Nachr. 6: 46 (TL: Damhof, Germany: on *Comarum palustre*).  
*Phenacoccus comari*: Cockerell, 1897, American Naturalist 31: 589.  
*Coccura comari*: Šulc, 1908, Věstn. Klubu. Přírod. Prostějové: 64; Danzig, 1988: 701; Ben-Dov, 1994: 97.  
*Pseudococcus gavalovi* Borchsenius, 1936, Tr. Krasnodarsk. s.-kh. in-ta 4: 105 (TL: Georgia: on *Rubus caesius*).

**Diagnosis.** Body broad oval, 4.0–5.0 mm long and 3.6–3.8 mm wide. **Dorsum.** Cerarii 18 pairs with sclerotized area; each with 2–3 lanceolate setae and several trilocular pores (Fig. 1A); anal lobe cerarii with 3–5 lanceolate setae and several trilocular pores (Fig. 1B); penultimate cerarii with 4 lanceolate setae and several trilocular pores (Fig. 1C). Oral collar ducts forming a band along body margin and several on median thorax (Fig. 1F). **Venter.** Antennae 9 segmented. Circuli 3, large and round. Quinquelocular pores rare on median area of thorax (Fig. 1H). Multilocular pores confined on 4th–8th abdominal segments (Fig. 1I). Oral collar ducts forming a band along body margin and a few on median area of body (Fig. 1J). Anal lobes with sclerotized bar, with 7–9 slender setae, several trilocular pores, and 4 oral collar ducts (Fig. 1L).

**Material examined.** [GG] 1 ♀, Yeogi-san, Seodun-dong, Suwon, 5 VI 1999 (GM Kwon), on *Rubus crataegifolius* Bunge (Rosaceae); 6 ♀, same data, except for 22 VI 2000.

**Distribution.** Palaearctic region (Korea (South, new record)).

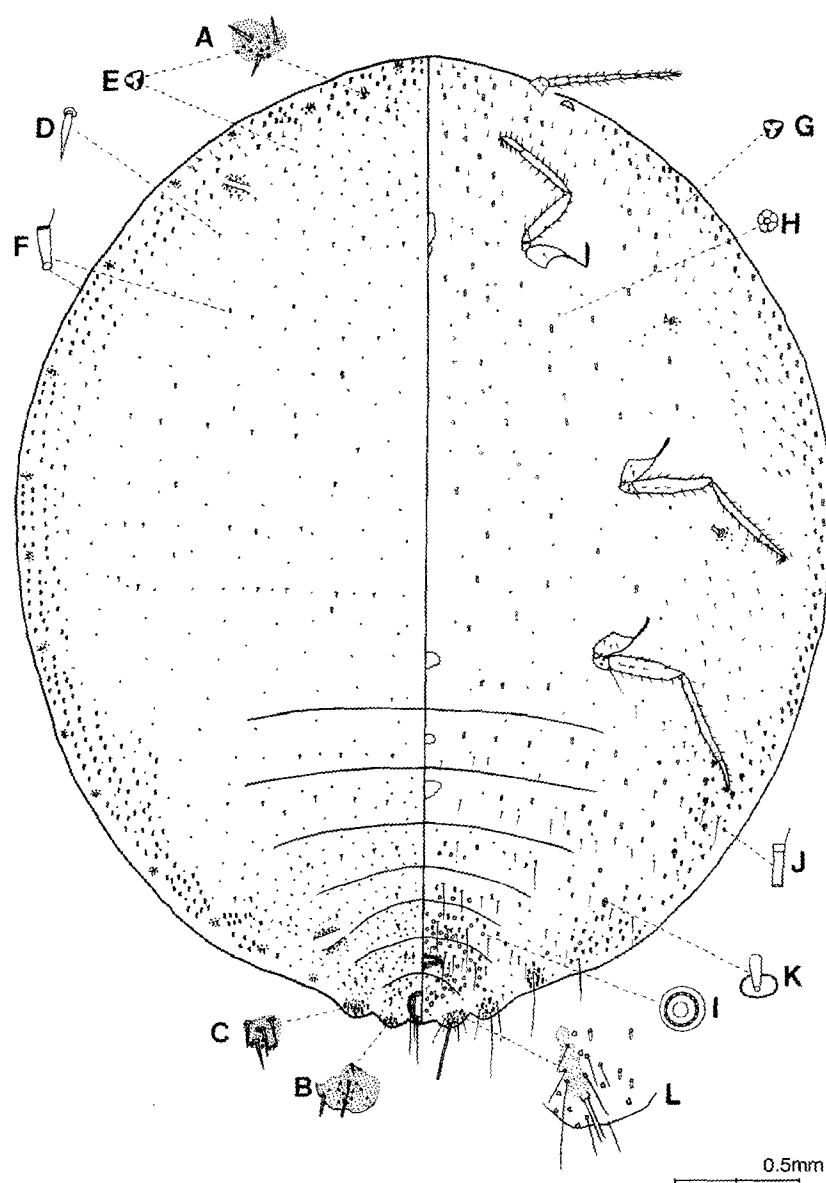
**Host plants.** Korea: Rosaceae (*R. crataegifolius*). World: Rosaceae (*Alchemilla sericata*, *Comarum palustre*, *Fragaria vesca*, *Potentilla anserina*, *P. argentea*, *P. reptans*, *Pyrus malus*, *Rosa spinosissima*, *Rubus caesius*, *R. fruticosus*, *R. idaeus*, *R. saxatilis*, *Sanguisorba* sp.) (Ben-Dov, 1994).

#### ***Coccura convexa* Borchsenius, 1949 둥근숨털가루깍지벌레**

*Coccura convexa* Borchsenius, 1949, Fauna SSSR 7: 302 (TL: Primorye Territory, Russia: on *Artemisia* sp.); Danzig, 1980: 139; Danzig, 1988: 701; Tang & Li, 1988: 45; Ben-Dov, 1994: 98; Paik, 2000: 50.

**Distribution.** Korea (North), Mongolia, and Russia (Primorye Territory).

**Host plants.** World: Asteraceae (*Artemisia* spp., *Filifolium sibiricum*); Chenopodiaceae



**Fig. 1.** Adult female of *Coccurea comari* (Künow, 1880). Dorsum (A-F): A. cerarius; B. anal lobe cerarius; C. penultimate cerarius; D. seta; E. trilocular pore; F. oral collar duct; Venter (G-L): G. trilocular pore; H. quinquelocular pore; I. multilocular pore; J. oral collar duct; K. similar oral rim duct; L. anal lobe.

(*Eurotia* sp.); Rosaceae (*Spiraea salicifolia*) (Ben-Dov, 1994).

**Remarks.** This species was recorded for the first time from North Korea by Danzig (1980), but no more specimen has been collected from South Korea.

***Coccurea suwakoensis* (Kuwana et Toyoda, 1915) 숨털가루깍지벌레**

*Phenacoccus suwakoensis* Kuwana & Toyoda, 1915, Insect World 19: 443 (TL: Honshu Island, Japan: on

*Cydona vulgaris* and *Osmanthus fragrans*).

*Rosanococcus suwakoensis*: Kanda, 1934, Insect World 38: 311.

*Phenacoccus ussuriensis* Borchsenius, 1936, Tr. Krasnodarsk. s.-kh. in-ta 4: 108.

*Coccurea suwakoensis*: Danzig, 1980, Coccids Far-Eastern USSR: 137; Kawai, 1980: 96; Danzig, 1988: 701;

Tang & Li, 1988: 59; Ben-Dov, 1994: 98; Paik, 2000: 50.

**Distribution.** Korea (North), Japan (Honshu Island, Nagano, Yamanshi), China, Mongolia, and Russia (Primorye Territory).

**Host plants.** World: Araliaceae: (*Kalopanax septemlobum*); Caprifoliaceae (*Lonicera* sp.); Leguminosae (*Maackia amurensis*); Oleaceae (*Fraxinus* sp., *F. mandshurica*, *Osmanthus* sp., *O. fragrans*, *Syringa amurensis*); Rosaceae (*Crataegus* sp., *Cydona vulgaris*, *Malus asiatica*, *M. manshurica*, *Padus maackii*, *Prunus* sp., *Pyrus* sp., *Rubus crataegifolius*, *Sorbaria sorbifolia*, *Spiraea salicifolia*) (Ben-Dov, 1994).

**Remarks.** This species was recorded for the first time from North Korea by Danzig (1980), but no specimen has been collected from South Korea.

### **Genus *Euripersia* Borchsenius, 1948 풀잎가루깍지벌레속**

*Euripersia* Borchsenius, 1948, Dokl. Akad. nauk SSSR 61(5): 955 (TS: *Euripersia amnicola* Borchsenius, 1948).

*Phenacoccopsis* Borchsenius, 1948, Dokl. Akad. nauk SSSR 61(5): 954 (TS: *Phenacoccopsis agropyri* Borchsenius, 1939).

### ***Euripersia herbacea* Danzig, 1971 풀잎가루깍지벌레**

*Euripersia herbacea* Danzig, 1971, Entoml. Obozr. 50(2): 375 (TL: Sudzykinskii Reserve, Primorye Territory, Russia: on *Silene koreana*); Danzig, 1980: 142; Danzig, 1988: 701; Ben-Dov, 1994: 155; Paik, 2000: 52.

**Distribution.** Korea (North), Mongolia, Russia (Altay, Primorye Territory).

**Host plants.** World: Alliaceae (*Allium* sp.); Asteraceae (*Artemisia* sp., *Artemisia frigida*); Caryophyllaceae (*Silene koreana*) (Ben-Dov, 1994).

**Remarks.** This species was recorded from North Korea by Danzig (1980), but no more specimens has been collected from South Korea.

### **Genus *Heliococcus* Šulc, 1912 잎가루깍지벌레속 (개칭)**

*Heliococcus* Šulc, 1912, Acta. Soc. Ent. 9: 39 (TS: *Heliococcus bohemicus* Šulc, 1912).

*Saliococcus* Kanda, 1934, Insect World 38: 309 (TS: *Dactylopius takae* Kuwana, 1907).

*Takahashicoccus* Kanda, 1959a, Kontyû 27(3): 179 (TS: *Heliococcus takahashii* Kanda, 1935).

### **Key to species of *Heliococcus* from Korea**

1. Antennae 7 segmented. On *Glycine hispida* ..... *H. glycinicola*
- Antennae 9 segmented ..... 2
2. Large and small crateriform ducts present on dorsum ..... 3
- Only large crateriform ducts present on dorsum (Fig. 4D). On *Zoysia* ..... *H. zoysiae*
3. Large crateriform ducts on only abdominal segments of dorsum. On *Agropyron* ..... *H. herbaceus*
- Large crateriform ducts on head, thorax and abdomen ..... 4
4. Small crateriform (Fig. 2E) ducts numerous on dorsum and grouped around large crateriform ducts (Fig. 2D). On *Rubus* ..... *H. kurilensis*
- Small crateriform (Fig. 3F) ducts several on dorsum and no grouped around large crateriform ducts (Fig. 3E). On *Pueraria* and *Alnus* ..... *H. puerariae*

***Heliococcus glycinicola* Borchsenius, 1956 콩잎가루깍지벌레**

*Heliococcus glycinicola* Borchsenius, 1956, Entomol. Obozr. 35(3): 674 (TL: North Korea: on *Glycine hispida*); Danzig, 1988: 701; Ben-Dov, 1994: 181; Paik, 2000: 52.

*Distribution.* Korea (North).

*Host plant.* World: Fabaceae (*Glycine hispida*) (Borchsenius, 1956).

*Remarks.* This species was described from North Korea by Borchsenius (1956), but no more specimen has been collected from South Korea.

***Heliococcus herbaceus* Borchsenius, 1956 풀잎가루깍지벌레**

*Heliococcus herbaceus* Borchsenius, 1956, Entomol. Obozr. 35(3): 672 (TL: North Korea: on *Agropyron* sp. and other grasses); Danzig, 1988: 701; Ben-Dov, 1994: 181; Paik, 2000: 52.

*Distribution.* Korea (North).

*Host plant.* Gramineae (*Agropyron* sp.) (Borchsenius, 1956).

*Remarks.* This species was described from North Korea by Borchsenius (1956), but no more specimens has been collected from South Korea.

***Heliococcus kurilensis* Danzig, 1971 루부스잎가루깍지벌레 (신칭) (Fig. 2)**

*Heliococcus kurilensis* Danzig, 1971, Entomol. Obozr. 50(2): 386 (TL: Kunashir Island, Russia: on *Rubus triphyllus*); Danzig, 1978b: 9; Danzig, 1980: 150; Danzig, 1988: 702; Ben-Dov, 1994: 182.

*Diagnosis.* Body elongated oval, 3.4–3.5 mm long and 1.9–2.1 mm wide. *Dorsum.* Cerarii 18 pairs; each with 2–3 lanceolate setae and 5–6 trilocular pores; anal lobe cerarii with 2 lanceolate setae and numerous trilocular pores (Fig. 2A). Crateriform ducts of 2 sizes; larger ones with conical at apex, forming a band along body margin, submargin and median area (Fig. 2D); smaller ones without conical at apex, forming by groups of 10–15 ducts around larger ducts (Fig. 2E). *Venter.* Antennae 9 segmented. Circulus 1, oval. Quinquelocular pores numerous on entire body (Fig. 2I). Multilocular pores confined on 6th–8th abdominal segments (Fig. 2J). Oral collar ducts forming transverse rows on 5th–7th abdominal segments (Fig. 2K). Small crateriform ducts grouped along all segments on body margin (Fig. 2L).

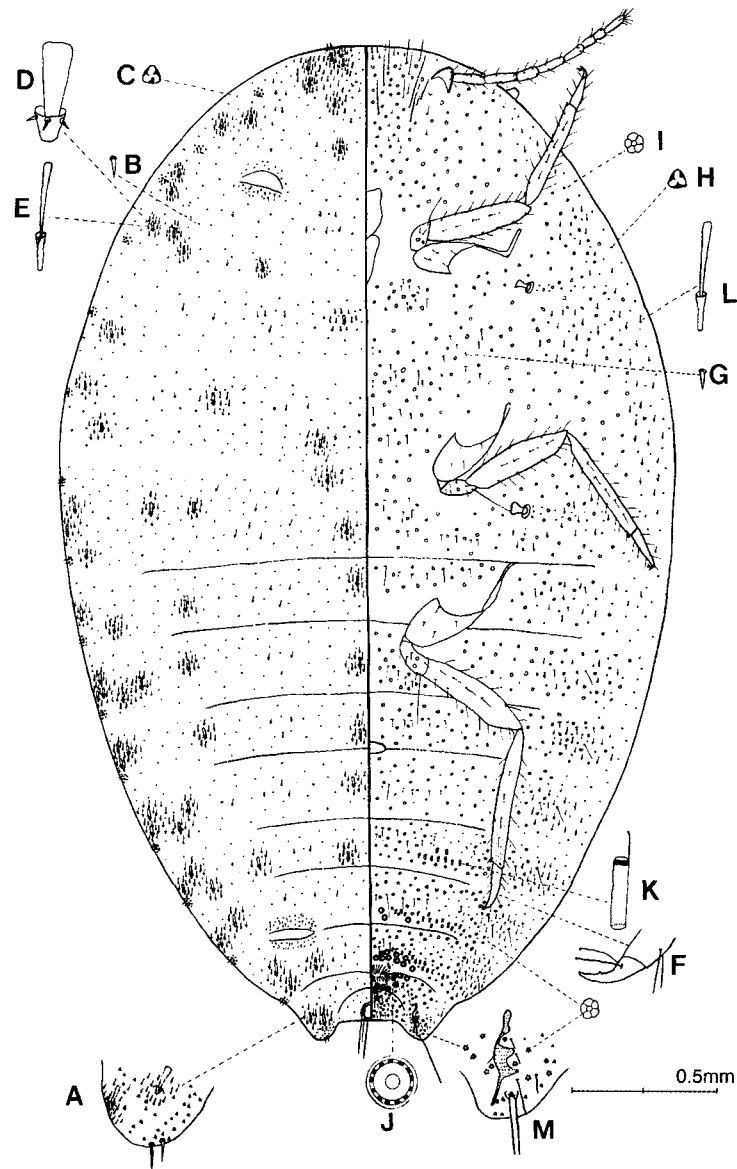
*Material examined.* [GG] 4 ♀, Yeogi-san, Seodun-dong, Suwon, 16 VI 1999 (GM Kwon), on *Rubus crataegifolius* Bunge (Rosaceae); 2 ♀, same data, except for 28 VI 1999; 1 ♀, same data, except for 22 VI 2000; 2 ♀ (nymphs), same data, except for 31 V 2001; 1 ♀, same data, except for 7 VI 2001. [GW] 13 ♀ (nymphs), Simpo-ri, Dogye, Samcheok, 17 V 2001 (GM Kwon), on *R. crataegifolius*. [CB] 3 ♀ (nymphs), Bongyang, Jecheon, 13 VII 2001 (GM Kwon), on *R. crataegifolius*; 1 ♀, same data, except for Gemujeon-ri, Gammul, Goesan, 12 VII 2001. [GB] 2 ♀ (1 adult, 1 nymph), Hogle-ri, Mungyeong, 18 V 2001 (GM Kwon), on *R. crataegifolius*; 13 ♀ (3 adult, 10 nymphs), same data, except for Daehyeon-ri, Bukhu, Andong, 29 VII 2001.

*Distribution.* Korea (South, new record) and Russia (Kunashir Island, Sakhalin Island).

*Host plants.* Korea: Rosaceae (*R. crataegifolius*). World: Rosaceae (*Rubus parvifolius*, *R. sachalinensis*, *R. triphyllus*) (Ben-Dov, 1994).

***Heliococcus puerariae* Kwon, Danzig, and Park, sp. nov. 취잎가루깍지벌레 (신칭) (Fig. 3)**

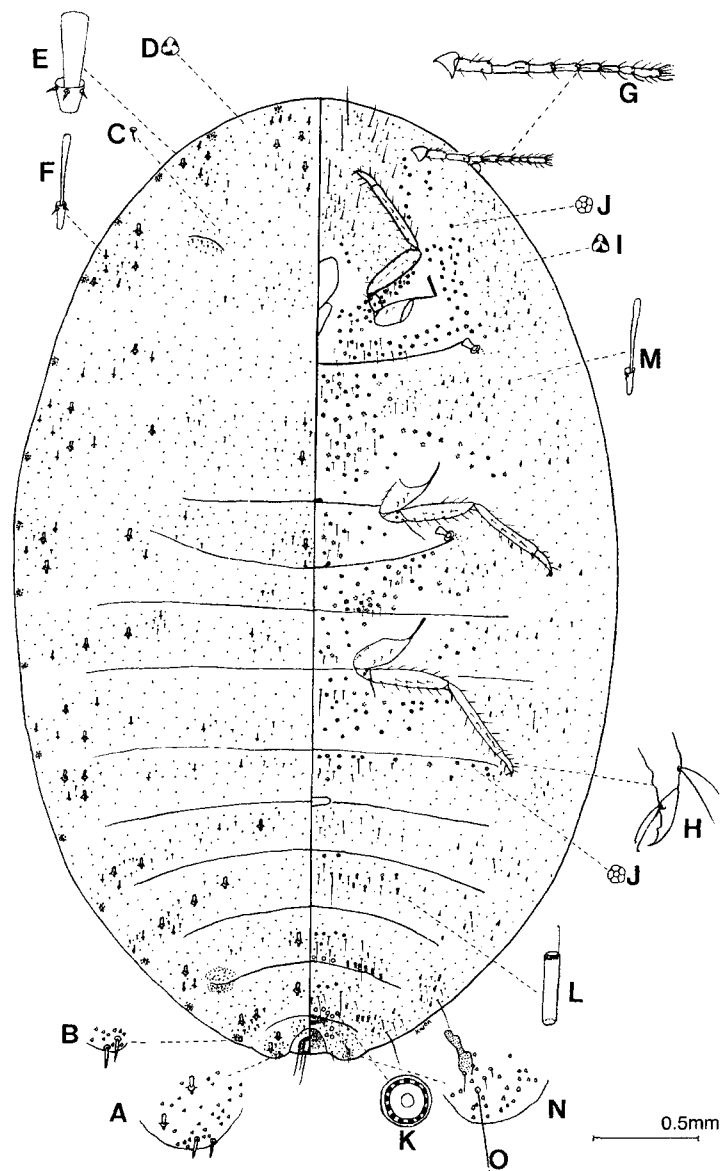
*Diagnosis.* This species is similar to *Heliococcus bohemicus* Šulc, 1912, but it can be separated by rare quinquelocular pores on ventral head (Fig. 3J) and by rare crateriform ducts of smaller size on dorsal medium and ventral margin (Fig. 3M).



**Fig. 2.** Adult female of *Heliococcus kuriensis* Danzig, 1971. Dorsum (A-E): A. anal lobe cerarius; B. seta; C. trilocular pore; D. larger crateriform duct; E. smaller crateriform duct; Venter (F-M): F. claw; G. seta; H. trilocular pore; I. quinquelocular pore; J. multilocular pore; K. oral collar duct; L. smaller crateriform duct; M. anal lobe.

*Description.* Female in live, covered with white wax powder. Body margin with 18 pairs of short wax filaments and numerous wax threads. Dorsal surface with 4 vertical lines formed insufficiency of white wax powder. Morphology: Body oval, 4.8 (3.4–4.8) mm long and 2.9 (1.9–2.9) mm wide. *Dorsum.* Ostioles 2 pairs; each with 6–10 short setae and numerous trilocular pores. Cerarii 18 pairs; each with 2–4 lanceolate setae and 5–12 trilocular pores;





**Fig. 3.** Adult female of *Heliococcus puerariae* Kwon, Danzig, and Park, sp. nov. Dorsum (A-F): A. anal lobe cerarius; B. penultimate cerarius; C. seta; D. trilocular pore; E. larger crateriform duct; F. smaller crateriform duct; Venter (G-N): G. antenna; H. claw; I. trilocular pore; J. quinquelocular pore; K. multilocular pore; L. oral collar duct; M. smaller crateriform duct; N. anal lobe; O. anal lobe seta.

anal lobe cerarii with 2 lanceolate setae (about 25  $\mu\text{m}$ ) and several trilocular pores (Fig. 3A); penultimate cerarii with 2 conical setae and several trilocular pores (Fig. 3B). Body setae slender and short (about 12.5  $\mu\text{m}$ ) (Fig. 3C). Trilocular pores evenly scattered on entire surface (Fig. 3D). Multilocular pores, oral collar ducts, and oral rim ducts absent. Crateriform ducts of 2 sizes; larger ones (about 37  $\times$  10  $\mu\text{m}$ ) with 4 small setae on base, forming a band along body

margin and rare on median area (Fig. 3E); smaller ones (about  $37 \times 5 \mu\text{m}$ ) with 2 small setae on base, scattering irregularly on margin and abdominal median area (Fig. 3F). Anal ring oval, with 6 slender setae (about  $225 \mu\text{m}$ ) and numerous cells. *Venter*. Antennae 9 segmented, 75, 159, 118, 77, 75, 63, 52, 45, and  $88 \mu\text{m}$  long (Fig. 3G). Eyes globular. Legs well developed; trochanter sensory pores with 4; claws with denticle (Fig. 3H); length of hind legs: coxae 310, trochanter 150, femora 400, tibiae 440, tarsus 135, and claws  $35 \mu\text{m}$  long; hind tibiae with a few translucent pores and without digitules. Spiracles 2 pairs on prothorax and mesothorax; each with around trilocular pores. Circulus 1, broad oval. Body setae hair-like, various in sizes. Trilocular pores scattered on entire surface (Fig. 3I). Quinquelocular pores (about  $7.5 \mu\text{m}$ ) scattered on median area of thorax and each abdominal segment (Fig. 3J). Multilocular pores (about  $10 \mu\text{m}$ ) about 20 on 6th–8th abdominal segments (Fig. 3K). Oral collar ducts (about  $15 \mu\text{m}$ ) several on median area of 5th–8th abdominal segments (Fig. 3L). Crateriform ducts of smaller size with 1 small seta on base, forming a band along body submargin. (Fig. 3M). Vulva present between 7th and 8th abdominal segments. Anal lobes with sclerotized small bar, with 5 setae and numerous trilocular pores (Fig. 9N); anal lobe setae  $145 \mu\text{m}$  long (Fig. 3O).

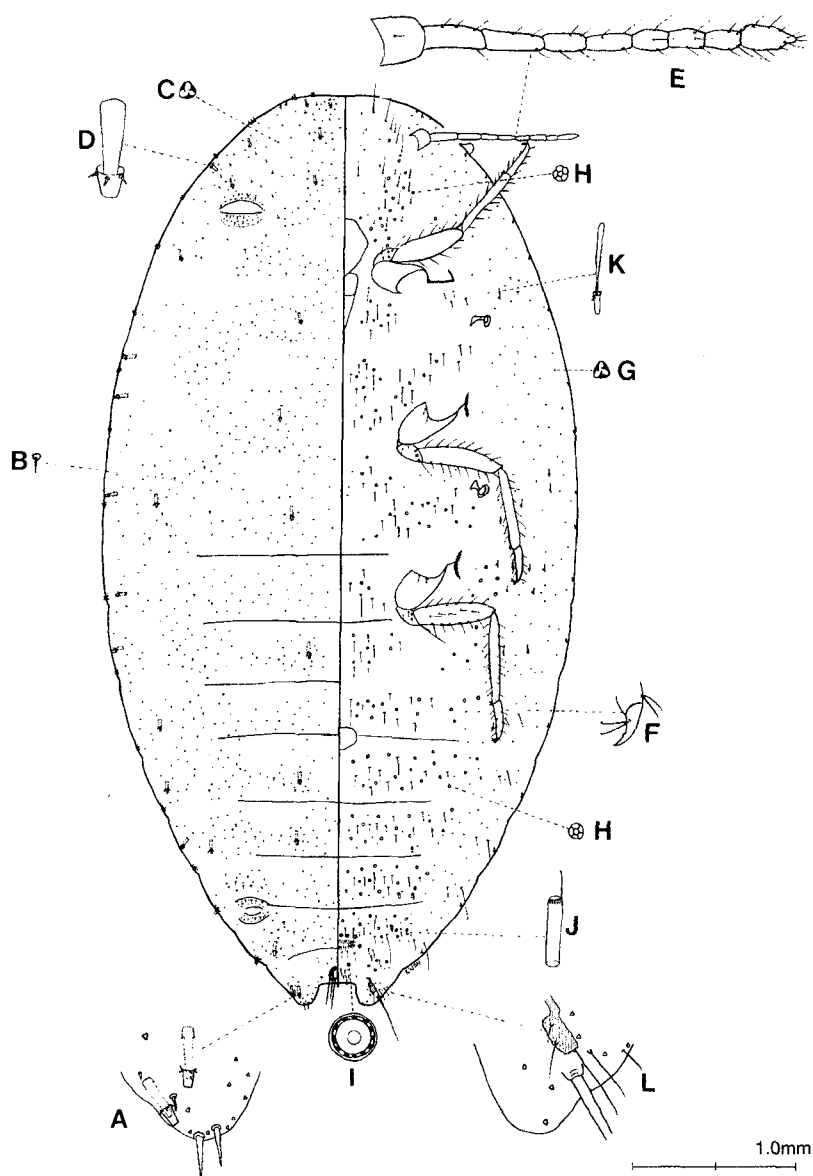
*Types*. Holotype: Adult female, Gurye-ri, Iyang, Hwasun, Jeollanam-do; Korea, 24 V 2001, on *Pueraria thunbergiana* Benth (Fabaceae), coll. GM Kwon. Paratypes: 9 adult females and 2 nymphs from same data as the holotype; 1 ♀, Sinoe-ri, Namyang, Hwaseong, GG, 8 VI 2001, on *Alnus japonica* Steud (Betulaceae), coll. GM Kwon; 1 ♀, Jinyeong-eu, Kimhae, GN, V 2001, on *P. thunbergiana*. coll. YH Lee; 1 ♀, Sehwa-ri, Gujwa, Bukjeju, JJ, 13 VI 2001, coll. GM Kwon. All types are deposited in the NIAST collection.

*Etymology*. This species is named after its host genus *Pueraria* DC.

***Heliococcus zoysiae* Kwon, Danzig, and Park, sp. nov.** 잔디잎가루깍지벌레 (신칭) (Fig. 4)

*Diagnosis*. This species is similar to *Heliococcus herbaceus* Borchsenius, 1956, but it can be separated by the absence of smaller crateriform ducts on dorsum and the presence of numerous quinquelocular pores on medium of ventral entire surface.

*Description*. Body elongated oval, 2.8 (2.6–2.8) mm long and 1.5 (1.2–1.5) mm wide. *Dorsum*. Ostioles 2 pairs; each with 8–10 short setae and numerous trilocular pores. Cerarii 18 pairs; each with basal swollen 2 lanceolate setae (about  $25 \mu\text{m}$ ) and several trilocular pores; anal lobe cerarii with 2 large lanceolate setae and several trilocular pores (Fig. 4A). Body setae (about  $7 \mu\text{m}$ ) slender and short (Fig. 4B). Trilocular pores scattered on entire surface (Fig. 4C). Multilocular pores, oral collar ducts, and oral rim ducts absent. Crateriform ducts of larger size (about  $45 \times 10 \mu\text{m}$ ) with 4 small setae on base, forming a band along body margin and medium (Fig. 4D). Anal ring oval, with 6 slender setae (about  $140 \mu\text{m}$ ) and numerous cells. *Venter*. Antennae 9 segmented, 55, 75, 80, 50, 50, 45, 45, 45, and  $79 \mu\text{m}$  long (Fig. 4E). Eyes globular. Legs well developed; trochanter sensory pores with 4; claws with denticle (Fig. 4F); length of hind legs: coxae 230, trochanter 115, femora 275, tibiae 320, tarsus 115, and claws  $30 \mu\text{m}$ ; hind tibiae with a few translucent pores and digitules. Spiracles 2 pairs on prothorax and mesothorax. Circulus 1, broad oval. Body setae hair-like, various in sizes. Trilocular pores scattered on entire surface (Fig. 4G). Quinquelocular pores (about  $7.5 \mu\text{m}$ ) numerous on median area of each segment (Fig. 4H). Multilocular pores (about  $10 \mu\text{m}$ ) about 10 around vulva (Fig. 4I). Oral collar ducts (about  $20 \mu\text{m}$ ) several on median area of 5th–7th abdominal segments (Fig. 4J). Crateriform ducts of smaller size (about  $25 \times 3 \mu\text{m}$ ) with 1 small seta on base, forming a band along body margin (Fig. 4K). Vulva present between 7th and 8th abdominal segments. Anal lobes with sclerotized bar, with 6 setae and several trilocular pores (Fig. 4L).



**Fig. 4.** Adult female of *Heliococcus zoysiae* Kwon, Danzig, and Park, sp. nov. Dorsum (A-D): A. anal lobe cerarius; B. seta; C. trilocular pore; D. larger crateriform duct; Venter (E-L): E. antenna; F. claw; G. trilocular pore; H. quinquelocular pore; I. multilocular pore; J. oral collar duct; K. smaller crateriform duct; L. anal lobe.

*Types.* Holotype: adult female, Buchon-ri, Busan, Jangheung, Jeollanam-do, Korea, 18 IX 2001, on *Zoysia japonica* Steud (Gramineae), coll. GM Kwon. Paratypes: 2 females and 6 nymphs from same data as the holotype. All types are deposited in the NIAST collection.

*Etymology.* This species is named after its host genus *Zoysia* Willd.

**Genus *Peliococcus* Borshsenius, 1948** 쪽가루깍지벌레속

*Peliococcus* Borshsenius, 1948, Dokl. Akad. nauk SSSR 61(5): 954 (TS: *Phenacoccus chersonensis* Kiritchenko, 1936).

***Peliococcus chersonensis* (Kiritchenko, 1936)** 쪽가루깍지벌레 (Fig. 5)

*Phenacoccus chersonensis* Kiritschenko, 1936, Entomol. Obozr. 26(1): 138 (TL: Odessa, Ukraine: on *Artemisia austriaca* and *A. maritima*).

*Spinococcus artemisiae* Tereznikova, 1968, Dok. Akad. nauk URSR 3: 281 (TL: Kherson, Ukraine: on *Artemisia austriaca*).

*Peliococcus chersonensis*: Borshsenius, 1948, Dokl. Akad. nauk SSSR 61(5): 954; Danzig, 1980: 120 (first record in Korea); Danzig, 1988: 699; Tang & Li, 1988: 61; Ben-Dov, 1994: 292; Paik, 2000: 54; Danzig, 2001: 139.

**Diagnosis.** Body elongated oval, 2.0–2.9 mm long and 1.3–1.6 mm wide. **Dorsum.** Cerarii 18 pairs; each cerarii forming by 2 conical setae with trilocular pores at the base (Fig. 5A). Multilocular pores (Fig. 5D) associated with 1–4 oral collar ducts of 2 shapes, forming transverse rows on body median area (Fig. 5E, 5F). **Venter.** Antennae 9 segmented (Fig. 5G). Circulus 1, oval. Quinquelocular pores on median area of thorax and 1st–5th abdominal segments (Fig. 11K). Multilocular pores associated with 2–3 oral collar ducts of 2 shapes, scattered on thorax and forming transverse rows on abdominal segments.

**Material examined.** [JJ] 9♀ (3 adults, 6 nymphs), Songak-san, Sangmo-ri, Daejeong, Namjeju, 14 VI 2001 (GM Kwon), on *Chrysanthemum indicum* Linne (Asteraceae).

**Distribution.** Korea, China, Mongolia, Russia (Primorye Territory), and Europe.

**Host plants.** Korea: Asteraceae (*C. indicum*). World: Asteraceae (*Ajania trifida*, *Artemisia argyi*, *A. austriaca*, *A. fragrans*, *A. frigida*, *A. gmelinii*, *A. maritima*, *A. marschalliana*, *A. salicis*, *A. schrenkiana*, *A. scoparia*, *A. sublessingiana*, *Seriphidium compactum*, *Tanacetum achilleaoides*, *T. achilleifolium*); Chenopodiaceae (*Kochia prostrata*); Rosaceae (*Spiraea salicifolia*) (Ben-Dov, 1994; Danzig, 2001).

**Genus *Phenacoccus* Cockerell, 1893** 숨깍지벌레붙이속

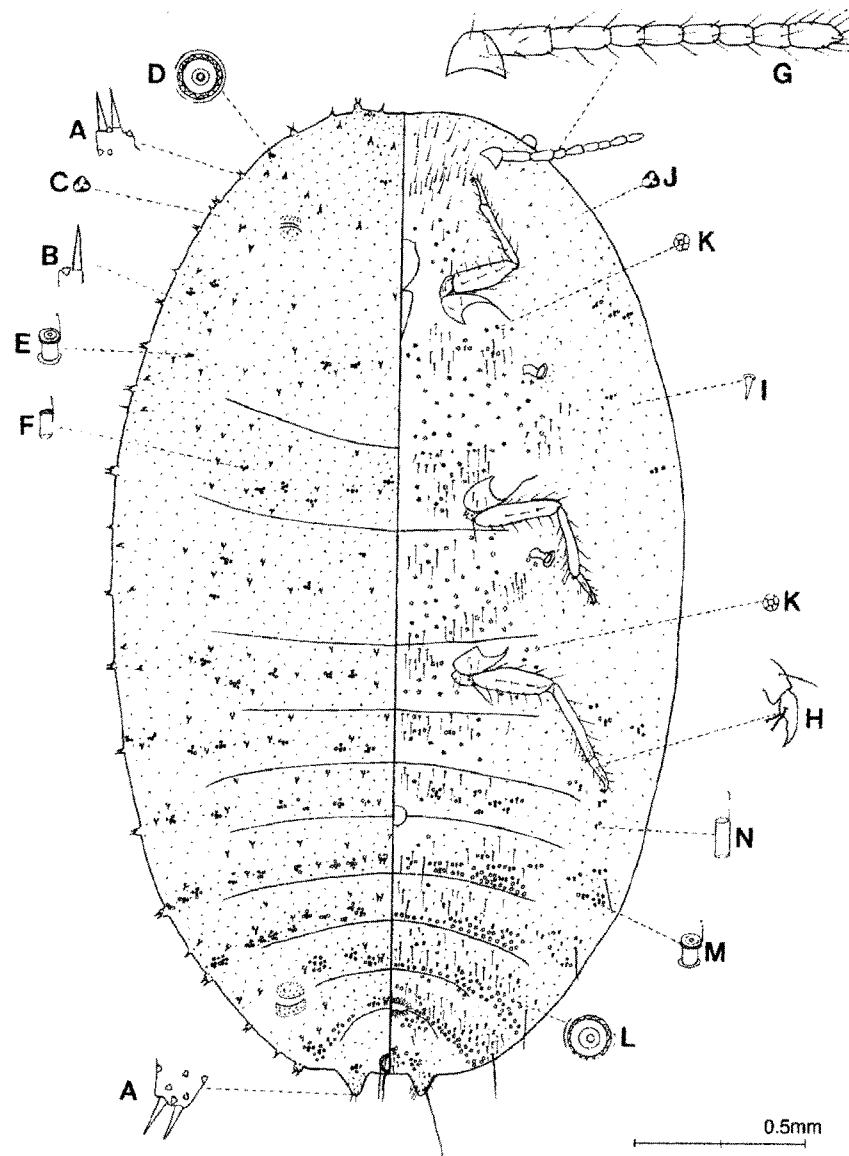
*Phenacoccus* Cockerell, 1893, Ent. News 4: 318 (TS: *Pseudococcus aceris* Signoret, 1875).

*Paroudablis* Cockerell, 1900, Entomologist 33: 87.

*Peukinococcus* Šulc, 1944, Acta Soc. Sci. Nat. Moraviae 16(11): 2.

**Key to species of *Phenacoccus* in Korea**

1. Cerarii 18 pairs. Quinquelocular pore present. Multilocular pores absent on body margin ..... 2
  - Cerarii 2 pairs. Quinquelocular pore absent. Multilocular pores forming a wide band along body margin. On *Elymus* and *Festuca* ..... *P. poriferus*
2. More than three setae on anal lobe cerarius. Circulus present ..... 3
  - Two setae on anal lobe cerarius. Circulus absent. On grasses ..... *P. interruptus*
3. Oral collar ducts evenly scattered on entire surface of body. Small and short setae on dorsum ..... 4
  - Oral collar ducts forming a band along body margin and grouped on thorax and abdominal area of dorsum. Large and distinct setae on dorsum. On *Rubus* ..... *P. rubicola*
4. Circuli 2–5, usually 3. Body 3.5–5.0 mm long. On various plants ..... *P. aceris*
  - Circuli 1–3, usually 2. Body 1.9–2.2 mm long. On *Azalea*, *Rhododendron*, *Prunus*, and *Ulmus* ..... *P. azaleae*



**Fig. 5.** Adult female of *Peliococcus chersonensis* (Kiritchenko, 1936). Dorsum (A-F): A. cerarius; B. seta; C. trilocular pore; D. multilocular pore; E-F. oral collar duct; Venter (G-N): G. antenna; H. claw; I. seta; J. trilocular pore; K. quinelocular pore; L. multilocular pore; M-N. oral collar duct.

***Phenacoccus aceris* (Signoret, 1875) 긴숨까지벌레불이**

*Pseudococcus aceris* Signoret, 1875, Ann. Soc. Ent. France 5(5): 329 (TL: France: on *Acer* sp.).

*Phenacoccus aceris*: Cockerell, 1896, Bull. Ill. Stat. Lab. Nat. Hist. 4: 324; Ferris, 1950: 126; Will 1962: 34; Paik, 1978: 197; Danzig, 1980: 124; Kawai, 1980: 94; Danzig, 1988: 700; Kosztarab & 1988: 123; Tang, 1992: 530; Ben-Dov, 1994: 304; Kosztarab, 1996: 155; Paik, J.C., 2000: 56.

*Phenacoccus pergandei* Cockerell, 1896, Bull. USDA Div. Entomol. 4: 55; Kanda, 1935: 278; Kanr

300; Kawai, 1980: 94; Tang, 1992: 543.

*Phenacoccus polyphagus* Borchsenius, 1949, Fauna SSSR: 213 (TL: Vladivostok, Primorye Territory, Russia: on *Fraxinus excelsior*).

*Phenacoccus prunicola* Borchsenius, 1962, Tr. Zool. in-ta AN SSSR 30: 232 (TL: Dali, Yunnan Province, China: on *Armeniaca* sp.).

**Material examined.** [GG] 3 ♀, Suwon, 11 V 1977 (WH Paik), unknown host plant; 4 ♀ (nymphs), Yeogi-san, Seodun-dong, Suwon, 4 X 1999 (GM Kwon), on *Malus pumila* Miller (Rosaceae); 2 ♀, same data, except for 16 V 2000; 2 ♀, 22 V 2000; 1 ♀, 1 V 2001; 4 ♀, same locality, 24 V 2001 (HW Byun), on *Alnus* (Betulaceae); 8 ♀, Jubuk-ri, Yangji, Yongin, 4 V 2001 (GM Kwon), on *Prunus serrulata* Lindley (Rosaceae). [CN] 3 ♀, Mokcheon-myeon, Cheonan, 10 V 2001 (HW Byun), on *Magnolia* (Magnoliaceae). [JB] 2 ♀, Iksan, 2 VI 1977 (WH Paik), on *Diospyros kaki* Thunberg (Ebenaceae). [GN] 1 ♀, Geoje, 18 V 1977 (WH Paik), on *Chaenomeles sinensis* Koehne (Rosaceae); 1 ♀, same data, except for *Magnolia kobus* A.P. De Candolle (Magnoliaceae). [JJ] 1 ♀ (nymph), Jeju, 17 X 1977 (WH Paik), on *Viburnum awabuki* K. Koch (Caprifoliaceae); 3 ♀, Samdo-dong, Jeju, 18 IV 2000 (GM Kwon), on *Prunus* (Rosaceae); 1 ♀, same data, except for 16 IV 2000, on *Camellia japonica* Linne (Theaceae); 5 ♀, Gimnyeong-ri, Gujwa, Bukjeju, 18 IV 2000 (GM Kwon), unknown host plant; 4 ♀, Seogwipo, 20 IV 1977 (WH Paik), on *Celtis sinensis* Pers. var. *japonica* (Planch.) Nakai (Ulmaceae). [No Data] 9 ♀ (WH Paik), on *V. awabuki*.

**Distribution.** Holarctic region.

**Host plants.** Korea: Betulaceae (*Alnus* sp.); Caprifoliaceae (*V. awabuki*); Ebenaceae (*D. kaki*); Magnoliaceae (*Magnolia* sp., *M. kobus*); Rosaceae (*Chaenomeles sinensis*, *M. pumila*, *Prunus* sp., *P. serrulata*); Theaceae (*Camellia japonica*); Ulmaceae (*Celtis sinensis*). World: Sixty-five species in 25 families (Ben-Dov, 1994).

#### ***Phenacoccus azaleae* Kuwana, 1914 철쭉썩꼭지벌레붙이**

*Phenacoccus azaleae* Kuwana, 1914, Journ. Ent. Zool. 6: 1 (TL: Japan: on *Azalea*); Kanda, 1941: 300 (first record in Korea); Paik, 1978: 200; Kawai, 1980: 95; Tang & Li, 1988: 45; Ben-Dov, 1994: 309; Paik, J.C., 2000: 57.

**Material examined.** [JN] 10 ♀ (nymphs), Hadong-ri, Hwayang, Yeosu, 7. X. 1999 (GM Kwon), on *Rhododendron indicum* (Linne) Sweet. (Ericaceae). [JJ] 14 ♀, Samdo-dong, Jeju, 16 IV 2000 (SH Kang), unknown host plant; 3 ♀, same data, except for *R. indicum*; 4 ♀, same data, except for 18 IV 2000 (GM Kwon).

**Distribution.** Korea, Japan, and Mongolia.

**Host plants.** Korea: Ericaceae (*R. indicum*). World: Ericaceae (*Azalea* sp., *Rhododendron* sp.); Rosaceae (*Prunus salicina*); Ulmaceae (*Ulmus macrocarpa*) (Ben-Dov, 1994).

#### ***Phenacoccus interruptus* Green, 1923 풀썩썩꼭지벌레붙이**

*Phenacoccus interruptus* Green, 1923, Ent. Mon. Mag. 59: 215 (TL: Camberley, Surrey, England: on grass); Danzig, 1980: 132; Danzig, 1988: 700; Kosztarab & Kozar, 1988: 130; Ben-Dov, 1994: 326; Paik, 2000: 57.

*Paroudablis interruptus*: Borchsenius, 1949, Fauna SSSR 7: 240.

*Caulococcus interruptus*: Tang, 1992, Pseudococcidae China: 430.

**Distribution.** Palaearctic region.

**Host plants.** World: Gramineae (*Agropyron* sp., *Arundinella hirta*, *Cynodon dactylon*, *Dactylis glomerata*, *Elymus angustus*, *E. giganteus*, *Festuca* sp., *Sieglingia* sp.) (Ben-Dov, 1994).

**Remarks.** This species was recorded from the Korean Peninsula by Danzig (1980), but no more specimen has been collected from South Korea.

***Phenacoccus poriferus* Borchsenius, 1949 구멍숨꼭지벌레붙이**

*Phenacoccus poriferus* Borchsenius, 1949, Fauna SSSR 7: 234 (TL: Primorye Territory, Russia: on grass); Danzig, 1980: 135; Danzig, 1988: 700; Ben-Dov, 1994: 338; Paik, 2000: 58.

*Phenacoccus comitans* Bazarov, 1967, Dokl. Akad. nauk Tadzh. SSR 10: 62 (TL: Tadzhikistan: Pamir, on roots of *Elymus* sp.).

*Caulococcus comitans*: Tang, 1992, Pseudococcidae China: 424.

*Caulococcus poriferus*: Tang, 1992, Pseudococcidae China: 433.

**Distribution.** Korea (North), China, Mongolia, Russia (Primorye Territory), and Tadzhikistan.

**Host plants.** World: Gramineae (*Elymus chinensis*, *E. dasystachys*, *E. mollis*, *Festuca supina*) (Ben-Dov, 1994).

**Remarks.** This species was recorded from the Korean Peninsula by Danzig (1980), but no more specimen has been collected from South Korea.

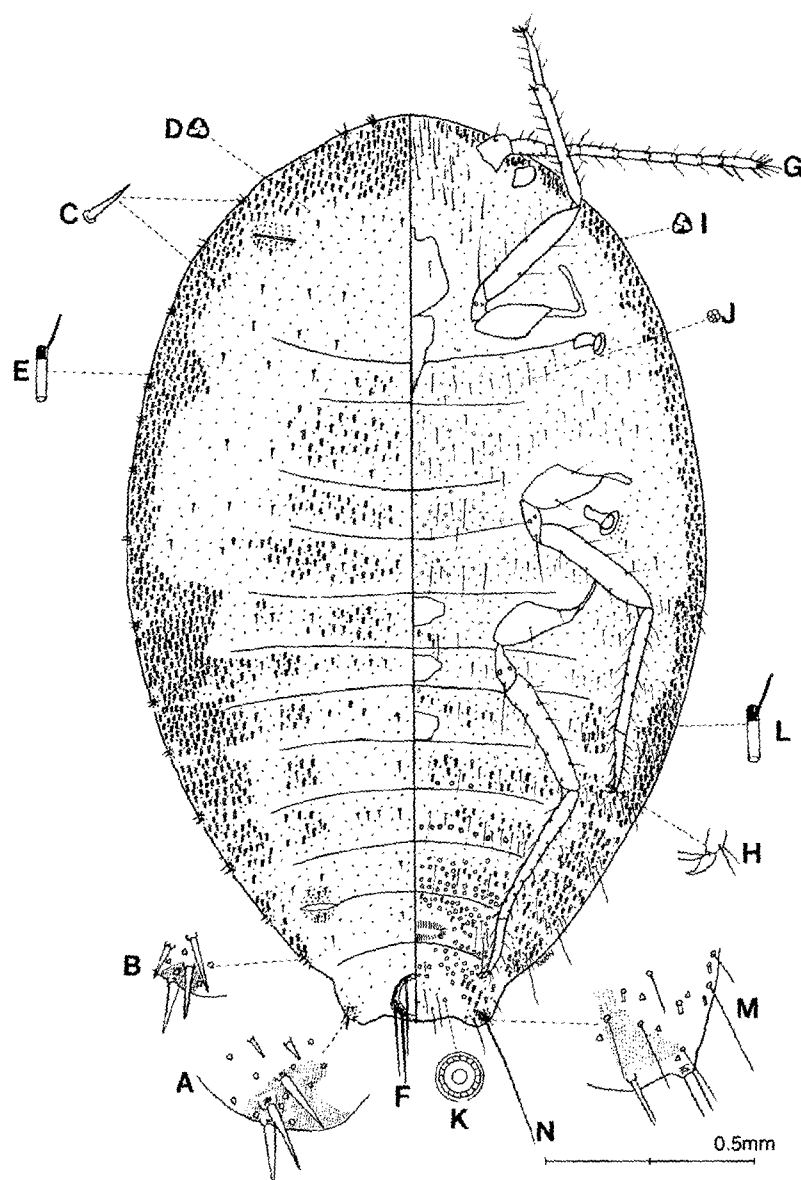
***Phenacoccus rubicola* Kwon, Danzig and Park, sp. nov. 산딸기숨꼭지벌레붙이 (신칭)**  
(Fig. 6)

**Diagnosis.** This species is similar to *Phenacoccus isadenatus* Danzig, 1971, but it can be separated by the presence of 3 circuli and confined multilocular pores on 4th–8th abdominal segments of venter.

**Description.** Body elongated oval, 2.2 mm long and 1.4 mm wide. **Dorsum.** Ostioles 2 pairs; each with 6–7 lanceolate setae and several trilocular pores. Cerarii 18 pairs; each with 2–3 lanceolate setae and a few trilocular pores; anal lobe cerarii with sclerotized area, with 3 lanceolate setae (about 43 µm) and several trilocular pores (Fig. 6A); penultimate cerarii with sclerotized area, with 4 lanceolate setae and several trilocular pores (Fig. 6B). Body setae (20–30 µm) lanceolate, forming transverse rows on entire surface (Fig. 6C). Trilocular pores evenly scattered on entire surface (Fig. 6D). Multilocular pores absent. Oral collar ducts (about 20 µm) forming a band along body margin and grouped on thorax and abdominal median area (Fig. 6E). Oral rim ducts absent. Anal ring large and oval, with 6 slender setae (about 175 µm) and numerous cells (Fig. 6F). **Venter.** Antennae 9 segmented, 60, 90, 95, 90, 75, 65, 65, 50, and 65 µm long (Fig. 6G). Eyes globular. Legs well developed; trochanter sensory pores with 4; claws with denticle (Fig. 6H); length of hind legs: coxae 190, trochanter 110, femora 325, tibiae 370, tarsus 190, and claws 30 µm long. Spiracles 2 pairs on prothorax and mesothorax. Circuli 3, wider than long. Setae hair-like, forming transverse rows on entire surface, various in sizes. Trilocular pores scattered on entire surface (Fig. 6I). Quinquelocular pores most on median area of thorax and 1st–4th abdominal segments (Fig. 6J). Multilocular pores (about 10 µm) forming transverse rows on median area of 4th–8th abdominal segments (Fig. 6K). Oral collar ducts (about 20 µm) forming a band along body margin and transverse rows on abdominal segments (Fig. 6L). Vulva present between 7th and 8th abdominal segments. Anal lobes with sclerotized area, with 7 setae, 4 oral collar ducts, and 5 trilocular pores (Fig. 6M); anal lobe seta 325 µm long (Fig. 6N).

**Types.** Holotype: Adult female, Daehyeon-ri, Bukhu, Andong, Gyeongsangbuk-do, Korea, 6 V 2001, on *Rubus crataegifolius* Bunge (Rosaceae), coll. GM Kwon. Paratype: 1 nymph from same data as the holotype. All types are deposited in the NIAST collection.

**Etymology.** This species is named after its host genus *Rubus* Linne.



**Fig. 6.** Adult female of *Phenacoccus rubicola* Kwon, Danzig, and Park, sp. nov. Dorsum (A-F): A. anal lobe cerarius; B. penultimate cerarius; C. seta; D. trilocular pore; E. oral collar duct; F. anal ring; Venter (G-N): G. antenna; H. claw; I. trilocular pore; J. quinquelocular pore; K. multilocular pore; L. oral collar duct; M. anal lobe cerarius; N. anal lobe seta.

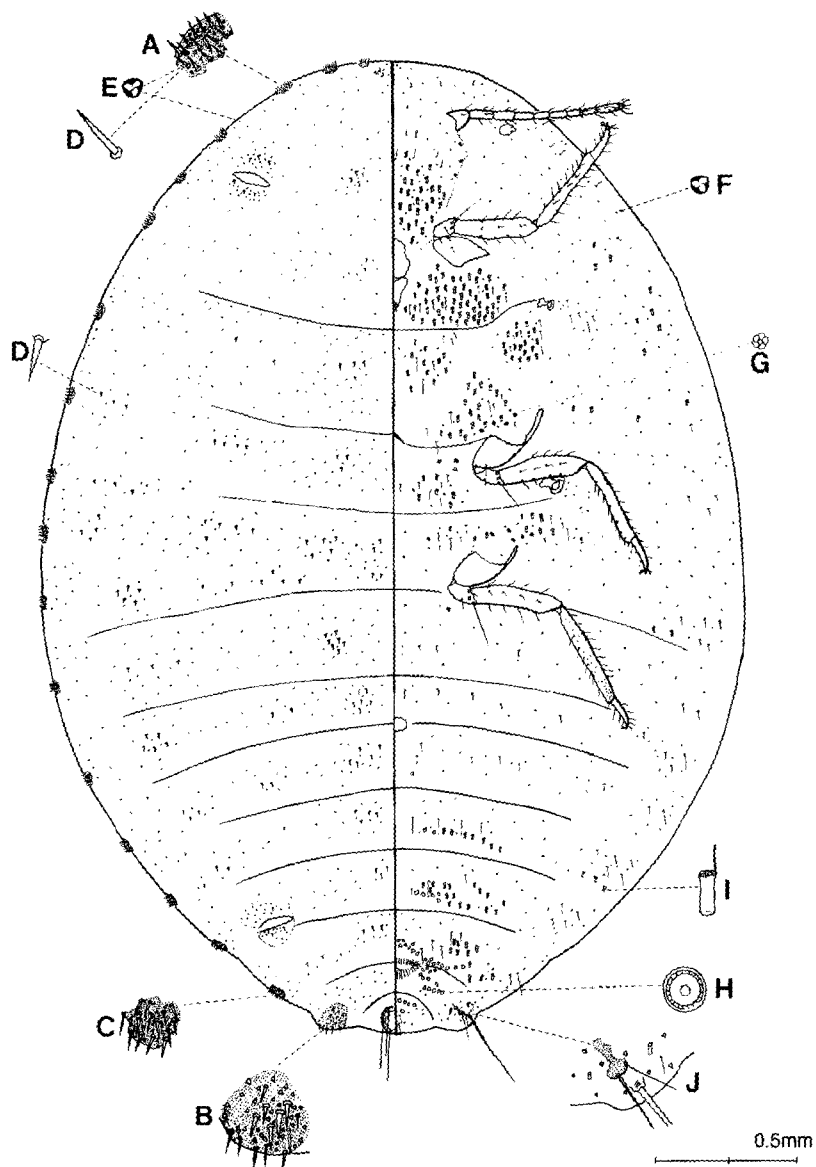
### Genus *Puto* Signoret, 1876 가시가루까지벌레속

*Puto* Signoret, 1876, Ann. Soc. Ent. France 5(5): 394 (TS: *Putonia antennata* Signoret, 1875).

*Ceroputo* Šulc, 1898, Věstn. Klubu. Přírod. Prostějovské 66: 1 (TS: *Ceroputo pilosellae* Šulc, 1898).

*Macrocerococcus* Leonardi, 1907, Boll. Lab. Zool. Gen. Agr. Portici. 1: 151 (TS: *Macrocerococcus superbus* Leonardi, 1907).





**Fig. 7.** Adult female of *Puto erigeroneus* (Kanda, 1959). Dorsum (A-E): A. cerarius; B. anal lobe cerarius; C. penultimate cerarius; D. seta; E. trilocular pore; Venter (F-J): F. trilocular pore; G. quinquelocular pore; H. multilocular pore; I. oral collar duct; J. anal lobe.

*Leococcus* Kanda, 1959b, Kontyû 27: 239 (TS: *Leococcus erigeroneus* Kanda, 1959).

***Puto erigeroneus* (Kanda, 1959) 망초가시가루깍지벌레 (신칭) (Fig. 7)**

*Leococcus erigeroneus* Kanda, 1959b, Kontyû 27: 240 (TL: Japan: on *Erigeron canadensis*).

*Puto erigeroneus*: Kawai, 1980, Scale Ins. Japan Colors: 96; Ben-Dov, 1994: 422.

**Diagnosis.** Body broad oval, 2.9–3.5 mm long and 2.2–2.8 mm wide. **Dorsum.** Cerarii 18 pairs with sclerotized area; each with 7–12 lanceolate setae and numerous trilocular pores (Fig. 7A); anal lobe cerarii with about 13 lanceolate setae and more than 30 trilocular pores (Fig. 7B). **Venter.** Antennae 9 segmented. Quinquelocular pores with several between legs (Fig. 7G). Multilocular pores forming irregular transverse rows; most on 6th–8th abdominal segments and few on 4th–5th abdominal segments (Fig. 7H). Oral collar ducts grouped between legs and thorax margin and forming transverse rows on 5th–8th abdominal segments (Fig. 7I).

**Material examined.** [GW] 6♀, Yangsan-ri, Gangleung, 16 V 2001 (GM Kwon), on *Erigeron canadensis* Linne (Asteraceae).

**Distribution.** Korea (South, new record) and Japan.

**Host plant.** Korea: Asteraceae (*E. canadensis*). World: Asteraceae (*E. canadensis*) (Kawai, 1980).

***Puto orientalis* Danzig, 1978 동양가시가루깍지벌레 (신칭) (Fig. 8)**

*Puto orientalis* Danzig, 1978a, Tr. Zool. in-ta AN SSSR 61: 128 (TL: Yakutia, Russia: on *Ribes rubrum*); Danzig, 1980: 117; Danzig, 1988: 699; Ben-Dov, 1994: 424.

**Diagnosis.** Body oval, 3.9–4.7 mm long and 2.3–3.0 mm wide. **Dorsum.** Cerarii 18 pairs and additional cerarii with sclerotized area; each cerarii with 2–29 lanceolate setae and 3–30 trilocular pores (Fig. 8A); anal lobe cerarii with about 14 lanceolate setae and numerous trilocular pores (Fig. 8B). **Venter.** Antennae 9 segmented. Quinquelocular pores absent. Multilocular pores forming 2–4 transverse rows on abdominal segments and numerous on thorax (Fig. 8F). Oral collar ducts forming transverse rows on abdominal segments, numerous on margin of abdominal segments, and a few on head (Fig. 8G).

**Material examined.** [Seoul] 9♀, Gwanak-san, Bongcheon-dong, 25 IV 1972 (WH Paik), on *Rhododendron schlippenbachii* Maxin. (Rosaceae).

**Distribution.** Korea (South, new record) and Russia (Primorye Territory, Sakhalin Island, Yakutia).

**Host plants.** Korea: Rosaceae (*R. schlippenbachii*). World: Araliaceae (*Eleutherococcus senticosus*); Crassulaceae (*Ledum macrophyllum*); Grossulariaceae (*Ribes rubrum*); Lythraceae (*Bergenia pacifica*); Rosaceae (*Physocarpus amurensis*); Schisandraceae (*Schisandra chinensis*) (Ben-Dov, 1994).

***Puto pilosellae* (Šulc, 1898) 쑥가시가루깍지벌레**

*Ceroputo pilosellae* Šulc, 1898, Věstn. Král. České. Spol. Nák 66: 2 (TL: Dvur kralove and Hodkovicky, Czechoslovakia: on *Hieracium pilosella*); Borchsenius, 1949: 286.

*Phenacoccus tomlini* Green, 1930, Ann. Mag. Nat. Hist. 10(5): 320 (TL: Solda, Tyrol, Italy: on *Leontodon hispidus*).

*Erium tomlini*: Lindinger, 1935, Entmol. Zeitschr. 49: 122.

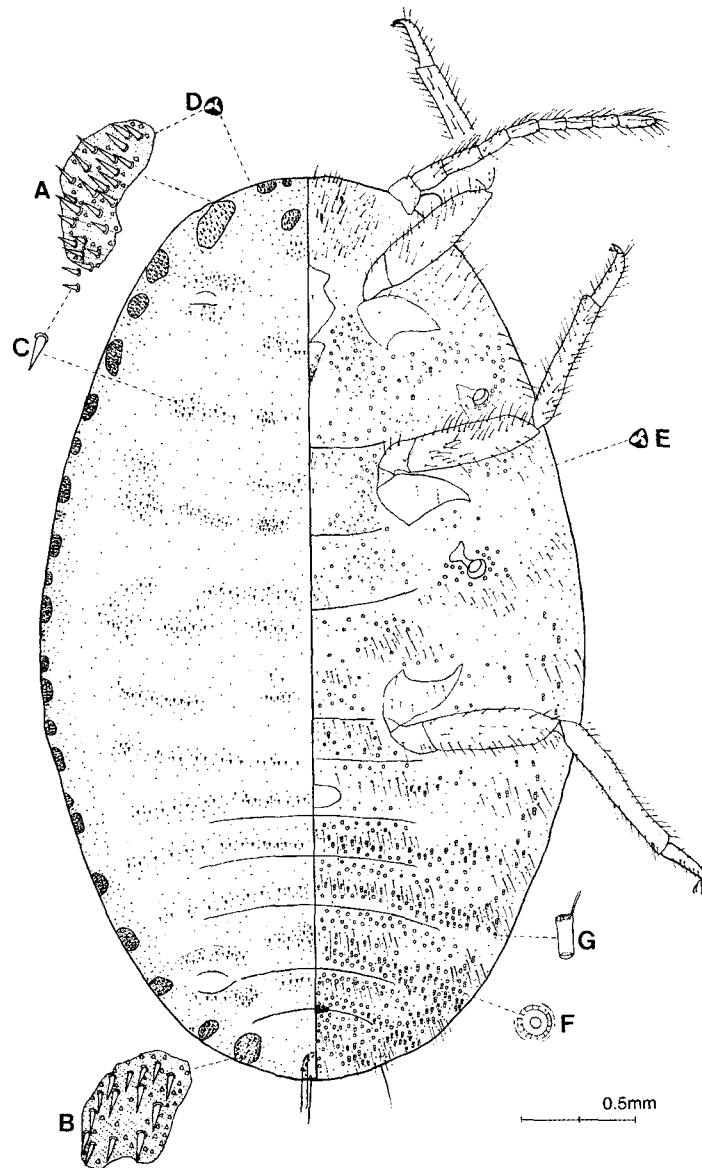
*Ceroputo pannosus* Borchsenius, 1949, Fauna SSSR 7: 288 (TL: Kokkoz, Crimea, Ukraine).

*Puto pilosellae*: Tereznikova, 1975, Fauna Ukraini 20(18): 243; Danzig, 1980: 113; Danzig, 1988: 698; Kosztarab & Kozar, 1988: 137; Ben-Dov, 1994: 428; Paik, 2000: 58.

**Distribution.** Palaearctic region.

**Host plants.** World: Thirty species in 14 families (Ben-Dov, 1994).

**Remarks.** This species was recorded for the first time from North Korea by Danzig (1980), but no more specimen has been collected from South Korea.



**Fig. 8.** Adult female of *Puto orientalis* Danzig, 1978. Dorsum (A-D): A. cerarius; B. anal lobe cerarius; C. seta; D. trilocular pore; Venter (E-G): E. trilocular pore; F. multilocular pore; G. oral collar duct.

**Tribe Rhizoecini Williams, 1969 뿌리가루깍지벌레속**

*Rhizoecini* Williams, 1969, Bull. Brit. Mus. Entomol. 23: 335; Danzig, 1980: 195.

*Rhizoecinae*: Williams, 1985, Australian mealybugs: 27; Tang, 1992: 42.

**Genus Geococcus Green, 1902 뿌리가루깍지벌레속**

*Geococcus* Green, 1902, Ent. Mon. Mag. 38: 262 (TS: *Geococcus radicum* Green, 1902).

***Geococcus oryzae* (Kuwana, 1907) 벼뿌리가루깍지벌레**

*Ripersia oryzae* Kuwana, 1907, Bull. Imp. Centr. Agr. Exper. Stat. 1(2): 186 (TL: Japan: on *Oryza sativa* and other plants).

*Geococcus oryzae*: Kuwana, 1923, Bull. Imp. Plant Quarant. Stat. Dept. Agr. Com. 3: 52; Williams, 1969: 513; Paik, 1978: 193; Kawai, 1980: 121; Ben-Dov, 1994: 173; Paik, 2000: 75.

*Geococcus unimaculatus* Borchsenius, 1956, Entomol. Obozr. 35(3): 671 (TL: Prov. Pyonganbuk-do, North Korea: on grasses).

*Distribution*. Korea (North) and Japan.

*Host plant*. World: Gramineae (*Oryza sativa*) (Borchsenius, 1956).

*Remarks*. This species was recorded for the first time from North Korea by Borchsenius (1956) as *Geococcus unimaculatus*, but no more specimen has been collected from South Korea.

**Tribe Sphaerococcini Cockerell, 1899 꼬리가루깍지벌레족**

*Sphaerococcini* Cockerell, 1899, Bull. Ill. Nat. Hist. Survey 5: 389.

*Sphaerococcinae*: Williams, 1985, Australian mealybugs: 27.

**Genus *Antonina* Signoret, 1875 꼬리가루깍지벌레속**

*Antonina* Signoret, 1875, Ann. Soc. Ent. France 5(5): 24 (TS: *Antonina purpurea* Signoret, 1875).

***Antonina crawi* Cockerell, 1900 꼬리가루깍지벌레**

*Antonina crawi* Cockerell, 1900, Psyche 9: 70 (TL: Japan: on Bamboo); Kuwana, 1932: 216; Kanda, 1941: 300 (first record in Korea); Zimmerman, 1948: 151; Ferris, 1953: 292; Williams, 1962: 8; Paik, 1978: 183; Danzig, 1980: 201; Danzig, 1988: 706; Ben-Dov, 1994: 37; Paik, 2000: 76.

*Antonina socialis* Newstead, 1901, Ent. Mon. Mag. 37: 85.

*Material examined*. [JB] 7 ♀, Songak-dong, Iksan, 21. III. 2001 (GM Kwon), on *Phyllostachys nigra* (Lodd.) Munro (Gramineae). [JN] 7 ♀, Boseong, 26 II 1998 (SH Lee), on *Phyllostachys* Sieb. et Zucc. (Gramineae); 9 ♀, Namyang-myeon, Koheung, 14 III 2000 (GM Kwon), on *Phyllostachys bambusoides* Sieb. et Zucc (Gramineae); 2 ♀, Kuljeon-ri, Dolsan, Yeosu, 7 X 1999 (GM Kwon), same host plant; 2 ♀, Jindo, 21 XII 1976 (WH Paik), on *Sasa borealis* (Hackel) Makino (Gramineae); 3 ♀, Gogeu-myeon, Wando, 2 VII 1977 (WH Paik), unknown host plant; 5 ♀, same data, except for 21 VII 1977, on *P. nigra*. [GB] 11 ♀, Wiseong-ri, Sobu, Gunwi, 16 VI 1998 (GM Kwon), on *P. nigra*; 6 ♀, same data, except for 5 VII 1999 (HM Cho); 1 ♀, Gyeongju, 15 XI 1976 (WH Paik), unknown host plant. [GN] 1 ♀, Sinho-ri, Chodong, Milyang, 25 IV 2001 (GM Kwon), on *Phyllostachys* sp.; 1 ♀, Dongrae-gu: Busan, 14 XI 1976 (WH Paik), on *Phyllostachys* sp.; 1 ♀, same data, except for *P. nigra*. [Unknown data] 3 ♀, (WH Paik).

*Distribution*. Palearctic (Korea, Japan, China, Russia (Kunashir Islands, Sakhalin Islands), Europe), Oriental, Australian, Nearctic, and Neotropical regions.

*Host plants*. Korea: Gramineae (*P. bambusoides*, *P. nigra*, *S. borealis*). World: Gramineae (*Arundinaria japonica*, *A. simoni*, *Bambusa* sp., *Phragmites communis*, *Phyllostachys nigra*, *P. quilioides*, *P. reticulata*, *Sasamorphia gracilis*, *Sasa kurilensis*) (Ben-Dov, 1994).

***Antonina vera* Borchsenius, 1956 풀꼬리가루깍지벌레**

*Antonina vera* Borchsenius, 1956, Entomol. Obozr. 35(3): 675 (TL: Korea (North): on grass); Danzig, 1980: 199; Danzig, 1988: 706; Ben-Dov, 1994: 42; Paik, 2000: 77.

*Distribution*. Korea (North), China, and Mongolia.

*Host plant*. World: Gramineae (*Cleistogenes* sp.) (Borchsenius, 1956).

*Remarks.* This species was described from North Korea by Borchsenius (1956), but no more specimen has been collected from South Korea.

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